

Claims

1. A microelectromechanical device having comprising at least one thermoelectric layer on a substrate, in particular a thermoelectric layer on a substrate,

wherein the-a thermal expansion coefficient of said at least one thermoelectric layer and the differs greatly from a thermal expansion coefficient of the substrate differing greatly, and

wherein said at least one thermoelectric layer-(1) is coupled to at least one stress reduction means-(2) for the targeted reduction of lateral mechanical stresses present in the layer-(1).

2. The microelectromechanical device as claimed in claim 1, wherein at least one stress reduction means-(2) is arranged between regions of at least one of a functional structure and/or a region with a thermoelectric layer-(1).

3. The microelectromechanical device as claimed in claim 1-~~or~~ 2, wherein at least one region of the substrate-(10) has an antiadhesion layer-(4) for reducing or preventing the adhesion of material of the layer-(1) and thus for forming at least one stress reduction means-(2).

4. The microelectromechanical device as claimed in claim 3, wherein the antiadhesion layer-(4) has a Ti-W alloy or SiO₂ or comprises at least one of Ti-W alloy ~~or~~ and SiO₂.

5. The microelectromechanical device as claimed in ~~at least one of the preceding claims~~ 1, wherein a vertical offset between two laterally adjoining layers-(1) is arranged as said stress reduction means-(2) in at least one region on the substrate-(10).

6. The microelectromechanical device as claimed in claim 5, wherein the vertical offset is formed by a prestructuring of the substrate-(10), in particular with using at least one of an electrode metal-(5) and/or an adhesion layer-(3).

7. The microelectromechanical device as claimed in at least one of the preceding claims 1, wherein at least one mechanically and/or chemically introduced trench is arranged as said stress reduction means-(2) in at least one region of the substrate-(10).

8. The microelectromechanical device as claimed in claim 7, wherein at least one trench has a depth of up to 100 μm .

9. The microelectromechanical device as claimed in at least one of the preceding claims 1, wherein the difference between the thermal expansion coefficient of at least one layer-(1) and the thermal expansion coefficient of the substrate-(10) is at least $3 * 10^{-6} \text{ K}^{-1}$, in particular at least 10^{-5} K^{-1} .

10. The microelectromechanical device as claimed in claim 9, wherein the difference between the thermal expansion coefficient of at least one layer and the thermal expansion coefficient of the substrate is at least 10^{-5} K^{-1} .

~~1011.~~ The microelectromechanical device as claimed in ~~at least one of the preceding claims 1~~, wherein the layer thickness of a said thermoelectric layer-(1) is between in the range of 2 and 100 μm .

~~1112.~~ The microelectromechanical device as claimed in claim ~~1011~~, wherein the layer thickness is ~~between~~ in the range of 20 and 100 μm .

~~1213.~~ The microelectromechanical device as claimed in at least one of the preceding claims 1, wherein the substrate ~~(10)~~ at least partly comprises at least one of mica, glass, BaF₂, silicon, silicon dioxide, silicon carbide and/or diamond.

~~12.~~ The microelectromechanical device as claimed by at least one of the preceding claims, featuring at least one semiconductor component composed of two substrates ~~(10)~~.

~~1214.~~ The microelectromechanical device as claimed in by at least one of the preceding claims 1, featuring wherein said thermoelectric layer forms at least one of a Peltier element and/or a thermogenerator element.

~~1315.~~ The microelectromechanical device as claimed in at least one of the preceding claims 1, wherein the thermoelectric layer ~~(1)~~ has a proportion of typical comprises a thermoelectric material, in particular including at least one of Bi₂Te₃, PbTe, SiGe and/or skutterudite.

~~1416.~~ A method for producing a microelectromechanical device as claimed in claim 1, in particular a thermoelectric semiconductor component, the method comprising wherein forming a layer ~~(1)~~ on a substrate ~~(10)~~ such that the layer is coupled to at least one stress reduction means ~~(2)~~ for the targeted reduction of lateral mechanical stresses present in the layer ~~(1)~~.

157. The method as claimed in claim 146, wherein forming the layer comprises forming a thermoelectric layer, and wherein the method further comprises arranging said at least one stress reduction means (2) is arranged between regions of at least one of a functional structure and/or a region with a thermoelectric layer-(1).

168. The method as claimed in claim 164 or 15, whereinfurther comprising forming an antiadhesion layer (4) for reducing or preventing the adhesion of material of the layer-(1) and thus for forming at least one stress reduction means (2) is grown in at least one region of the substrate-(10).

179. The method as claimed in ~~at least one of claims 14 to 16, wherein further comprising arranging a vertical offset between two laterally adjoining layers (1) is arranged as said stress reduction means (2) in at least one region on the substrate-(10).~~

1820. The method as claimed in ~~at least one of claims 164 to 17, wherein further comprising producing at least one trench is produced using at least one of mechanically and/or chemically processes as said stress reduction means (2) in at least one region of the substrate-(10).~~

21. A microelectromechanical device comprising:

a substrate having a first thermal expansion coefficient;
and
a thermoelectric layer formed over the substrate, the
thermoelectric layer having a second thermal expansion
coefficient that differs from the first thermal expansion
coefficient by at least 10^{-5} K^{-1} ;

wherein said at least one thermoelectric layer is divided
into a plurality of thermoelectric layer portions, each
thermoelectric layer portion being separated from adjacent
thermoelectric layer portions by a stress reduction region, and
wherein said each thermoelectric layer portion has a
thickness in the range of 2 and 100 μm , and an width in the range
of 1.4 to 20 mm.